ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

DATE: February 2000

BUDGET ACTIVITY: 2 - Applied Research

PE NUMBER AND TITLE: 0602716A Human Factors Engineering Technology

COST *(In Thousands)*	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	16204	19681	15786	16444	16503	16609	17254	Continuing	Continuing
AH34 Rural Health Technology	3128	3335	0	0	0	0	0	0	11483
AH70 Human Factors Engineering Systems Development	13076	16346	15786	16444	16503	16609	17254	Continuing	Continuing

A. Mission Description and Justification: The objectives of this program are, first, to maximize the effectiveness of soldiers in concert with their materiel so that they may survive and prevail on the battlefield. Specialized laboratory studies and field evaluations are conducted to collect performance data on the capabilities and limitations of soldiers, with particular attention on soldier and equipment interaction. Secondly, this program focuses on the researching, field testing, and empirical validation of methods for improving the coordinated functioning of civilian and military emergency medical teams. The work in this latter effort complements related Army programs in soldier performance, training and evaluation methodologies, and will provide direct research benefits to the Army's medical community, including combat casualty care on the battlefield and in other remote areas of operation. The work in this program is consistent with the Army Science and Technology Master Plan (ASTMP) and the Army Modernization Plan. All work under this PE is part of the Human Systems Tri-Service Reliance panel.

B. Program Change Summary	FY 1999	FY 2000	FY 2001
Previous President's Budget (FY 2000/2001 PB)	16473	16392	16270
Appropriated Value	16619	19792	
Adjustments to Appropriated Value			
a. Congressional General Reductions	-146		
b. SBIR / STTR	-203		
c. Omnibus or Other Above Threshold Reductions		-39	
d. Below Threshold Reprogramming			
e. Rescissions	-66	-72	
Adjustments to Budget Years Since (FY 2000/2001 PB)			-484
Current Budget Submit (FY 2001 PB)	16204	19681	15786

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE: February 2000
BUDGET ACTIVITY: 2 - Applied Research	PE NUMBER AND TITLE: 0602716A Human Factors Engineering Technology / PROJECT: AH34

COST (*In Thousands*)	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
AH34 Rural Health Technology	3128	3335	0	0	0	0	0	0	11483

Mission Description and Justification: This is a congressionally funded program. The Medical Teams program provides for the researching, field testing, and empirical validation of methods for improving the coordinated functioning of emergency medical teams (both military and civilian). This project, initially supported by Congress in FY96, extends previous Army research on the effective training and evaluation of military aviation crews and systematically applies it to the collection of hospital and pre-hospital personnel who must perform as an effective team during the initial "golden hour" of shock/trauma or acute patient care. Additionally, this project provides both the civilian and military medical communities with a rigorous framework for objectively assessing the "value-added" of selected telemedicine and medical decision management technologies.

FY 1999 Accomplishments:

- 3128 - Completed the evaluation of the MedTeams training and evaluation system at each of the cooperating hospitals selected in Phase I.
  - Conducted an extended team test bed at Madigan Army Medical Center.
  - Conducted a test of an advanced intra-team communication system at Madigan Army Medical Center and Rhode Island Hospital.
  - Generated, in conjunction with University of Maryland Shock Trauma Center, an improved protocol for field-to-hospital communications.
  - Introduced MedTeams research products to civilian and emergency care facilities at selected locations in CONUS.
  - Executed concept development for MedTeams combat casualty care with the cooperation of Army, Navy and Air Force participating hospitals.

Total 3128

FY 2000 Planned Program:

- 3245 - Disseminate the Emergency Team Coordination Course to military and civilian hospital emergency departments for fixed hospital facilities.
  - Distribute team coordination improvements throughout the military combat casualty care system.
  - Implement a lessons learned system.
- 90 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 3335

FY 2001 Planned Program: Project not funded in FY 2001.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)	DATE February 2000
BUDGET ACTIVITY **2 - Applied Research**	PE NUMBER AND TITLE **0602716A Human Factors Engineering Technology**
	PROJECT **AH70**

COST *(In Thousands)*	FY1999 Actual	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY2004 Estimate	FY2005 Estimate	Cost to Complete	Total Cost
AH70 Human Factors Engineering Systems Development	13076	16346	15786	16444	16503	16609	17254	Continuing	Continuing

Mission Description and Justification: This program focuses on maximizing the effectiveness of the soldier in concert with his materiel, in order to survive and prevail on the battlefield. Specialized laboratory studies and field evaluations are conducted to collect performance data on the capabilities and limitations of soldiers, with particular attention on soldier and equipment interaction. The resulting data are the basis for weapon systems and equipment design standards, guidelines, handbooks and soldier training and manpower requirements to improve equipment operation and maintenance. Application of advancements yields reduced workload, fewer errors, enhanced soldier protection, user acceptance, and allows the soldier to extract the maximum performance from the equipment.

FY 1999 Accomplishments:

- 4482 -Enhanced existing logistics data analysis capabilities to serve logisticians at appropriate echelons..
  - Refined operator workload models for unmanned ground vehicles.
  -Investigated the impact of multi-directional auditory displays on helicopter pilot performance. Published results and provided to the Aviation School and Aviation and Missile Command.
  -Generated a human performance measurement strategy to assess new command and control concepts in the distributed interactive simulation (DIS) environment.
  - Identified, in terms of soldier performance, how the application of 2-D and 3-D visualization concepts impacts the battle staff's task domain.
  - Identified and quantified which advanced visualization concepts enhance or detract from staff performance and how they support collaborative planning and problem solving by a geographically dispersed staff.
- 3997 -Verified and validated the human figure performance model (Jack), linked with physics based model, and began to incorporate data collected in 3-D.
  -Added training requirements analysis capability and enhanced performance degradation modeling to Improved Performance Research Integration Tool (IMPRINT) Version 3.
  - Collected performance data using the virtual reality capability for the individual soldier fighting systems in a DIS environment, compared results of live and virtual studies, and updated and validated the databases with actual research data. Transitioned data and guidelines to STRICOM.
- 4597 -Refined soldier system analysis and tradeoff tools and workload models for assessing soldier and unit performance and the life cycle and cost implications in concept and system designs. Enhanced human factors engineering field evaluation methods with soldier in the loop operational test data to upgrade existing capabilities to assess new technologies and systems.
  -Provided human factors engineering (HFE) support to AMC, AMC RDECs, TRADOC activities, battle labs, and other laboratories.

Total 13076

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BUDGET ACTIVITY **2 - Applied Research**	PE NUMBER AND TITLE **0602716A Human Factors Engineering Technology**
	PROJECT **AH70**

FY 2000 Planned Program:

- 5026 - Complete the simulation model of "Green Ramp" operations for the XVIII Airborne Corps. Conduct field trials on ammunition reconfiguration from single ammunition type loads to strategic configured loads (SCLs).
  - Conduct preliminary assessments of human factors issues including driver aiding, concurrent tasks, and motion sickness in support of TARDEC's Crew Integration and Automation Testbed (CAT) ATD. Design indirect vision driving experiments and participate in CAT demonstration. (Supports FCS)
  - Develop baseline task and workload models to target crew size reduction opportunities for the CAT ATD which supports FCS.
  - Conduct field study to determine the effect of advanced display technologies, e.g. 3-D audio, speech recognition and active noise reduction on dismounted soldier task performance under different levels of physical and mental workload.
  - In collaboration with Soldier Biological and Chemical Command – Natick Soldier Center (SBCCOM-NSC) and the Infantry School, define a dismounted soldier baseline day for use as an R&D standard scenario.
  - Examine effects of Objective Individual Combat Weapon (OICW) recoil on soldier shooting performance.
  - Based on previous work in support of the Virtual Environments for Dismounted Soldier STO, provide human factors design guidelines for the development of a next generation locomotion interface for a dismounted soldier simulator to STRICOM.
- 3299 Refine, validate, and provide predictive models of C2 soldier performance under varying levels of stress (degraded communications, extended shifts, information load), diverse staffing concepts, and advanced digitization technologies for medium brigade tactical operations center (TOC) for TRADOC Program Integration Office (TPIO) Army Battle Command System (ABCS), TRADOC System Manager (TSM) XXI, and TSM TOC.
  - Perform soldier focused assessments of various battlefield reasoning and multi-modal display systems to support commander and staff decision making processes.
  - Conduct human factors evaluation of ABCS functionality and maintenance of situation awareness in the battle command of light forces during the Joint Contingency Force (JCF) Advance Warfighting Experiment (AWE).
  - Complete development of a rule-based computer model of the intelligence production system which simulates how the quality of information in military intelligence databases and the soldier's ability to use that information will meet commander and staff military intelligence requirements.
- 5657 - Add the capability to model performance under stress to the Improved Performance Research Integration Tool (IMPRINT) and demonstrate links to advanced distributed simulation via high level architecture.
  - Evaluate and analyze soldier-in-the-loop operational test data and procedures to upgrade our capability to assess new technologies and systems.
  - Provide HFE support to AMC, AMC RDECs, TRADOC Centers, Schools and Battle Laboratories and other laboratories. (Includes FCS support)
- 2200 - Transition cognitive engineering STO products to address critical training, leader development and soldier support (TLS) research issues in the cognitive engineering of battle command operations.
  - Transition from the Advanced & Interactive Displays Fed Lab, the course-of-action planning tool "FOX-GA" and accompanying applications to CECOM's "CADET" for Command Post XXI ATD.
- 164 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

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	PROJECT **AH70**

Total 16346

FY 2001 Planned Program:

- 4999 - Provide simulation model for SCLs to Defense Ammunition Logistics Agency (DALA) and Combined Arms Support Command (CASCOM) and assist in the evaluation of the most effective and efficient SCL configuration location.
  - Analyze data from the FY 00 demo for CAT STO and provide human factors analysis to TARDEC. Develop plan for addressing new issues identified in demo to support FCS.
  - Integrate workload and crewstation design modeling results from Intra-vehicular Electronics Suite Tech Demo with FY00 CAT demo findings to develop baseline CAT ATD crew station designs which support FCS.
  - Translate research results on the effects of advanced audio display technologies on dismounted soldier tasks performance into design guidelines for use by NRDEC, the Infantry School and Dismounted Battlespace Battle Lab.
  - Validate the dismounted soldier baseline day for use in evaluating soldier equipment interface and compatibility. Transition to NRDEC and the Infantry School.
- 3798 - Expand previous soldier shooting performance research to investigate the effects of stabilizing weapon technology and provide results to Armament RDEC.
  - Expand models of C2 soldier performance during contingency, joint, strategic operations in order to specify optimum configuration of staff and digitization capabilities for these scenarios, to TPIO-ABCS, DARPA Command Post of the Future (CPOF), and Joint and Army Vision 2010 doctrinal elements.
  - Conduct follow-on human factors evaluation of ABCS functionality in the division command post exercise (DCX) to inform system integration in the first digital division.
  -Validate the intelligence production model (IPM) in intelligence field units at varying command levels.
- 5743 - Conduct proof-of-principle experiment of complex cognitive models embedded within soldier-system level models for practical system design evaluation.
  - Conduct an investigation of the integrated system behavior between the mobility interface device and the control systems for the dismounted soldier combatant simulation. Transition results to STRICOM and the Army Research Institute (ARI).
  - Provide HFE support to AMC, AMC RDECs, TRADOC Centers, Schools and Battle Laboratories and other laboratories.
- 1246 - Leverage Initial Brigade planning and experimentation to address cognitive engineering of battle command operations.
  - Transition final architecture, software and media of visualizations for multi-modal sensory computer control algorithms to the CPXXI ATD

Total 15786